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ABSTRACT

As an initial attempt to document the influence of class size reduction on overall student achievement, this report evaluates Project Challenge, a Tennessee Department of Education program to reduce at-risk student/teacher ratio in kindergarten through third grade classes in 17 rural Tennessee school systems. A summary of findings relating to the Student Teacher Achievement Ratio Project (Project STAR) and the Lasting Benefits Study is followed by discussion of the design and limitations of Project Challenge. The Tennessee Comprehensive Assessment Program (TCAP) achievement test was used to evaluate student achievement, and Project Challenge students were compared with students from Tennessee's 138 school systems. Results showed that from 1990 to 1991, 9 of the 17 systems in Project Challenge improved their statewide rankings in reading, and 10 Project Challenge systems improved their statewide rankings in mathematics. Continuous study is recommended as a means of documenting definitive effects from reduced class size and related school practices on student achievement. Eight tables of data and two figures are included, and a sample classroom information survey is appended. (MM)

# PROJECT CHALLENGE
## Preliminary Report

## An Initial Evaluation of The Tennessee Department of Education "At-Risk" Student/Teacher Ratio Reduction Project In Seventeen Counties



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## Abstract

The Tennessee Department of Education's innovative approach for using Federal Chapter I funds, and over four million dollars in state funds, to reduce kindergarten through third-grade class sizes in "poor" rural schools has resulted in the opportunity for 17 Tennessee school systems to offer more effective classroom practices. The Department's 1985-89 Student Teacher Achievement Ratio (STAR) Project concluded that reduced class-sizes in grades K-3 produced statistically and educationally significant achievement benefits. The pervasive and positive results in student gains of this large-scale, longitudinal experiment which utilized random assignment of students, and the continuation of these gains as shown in the Lasting Benefits Study (LBS) warranted the implementation of class-size reduction for schools in the lowest per capita (and highest percent of free/reduced lunch participation) income counties in Tennessee. Project Challenge, the program to reduce class sizes for schools in 17 counties, has produced these initial results: 1) an average increase of 5.3 ranks in reading and 2) and an average increase of 6.6 ranks in mathematics in the ranking of Tennessee's 138 school systems on the Tennessee Comprehensive Assessment Program (TCAP). This amounts to nearly a quarter (.25) of a standard deviation gain. These initial positive findings merit continuous study of improved achievement test scores. A period of analysis of at least three years is desirable to document definitive effects from reduced class-size and related school practices designed to improve student achievement. Overall the Project Challenge schools' systems scores for students in second grade are moving positively toward the State mean. Analysis using refined data will allow the benefits of this intervention to be analyzed and documented more thoroughly.

# PROJECT CHALLENGE: AN INITIAL EVALUATION OF TENNESSEE'S RURAL "AT-RISK" STUDENT/TEACHER RATIO REDUCTION PROJECT IN SEVENTEEN COUNTIES

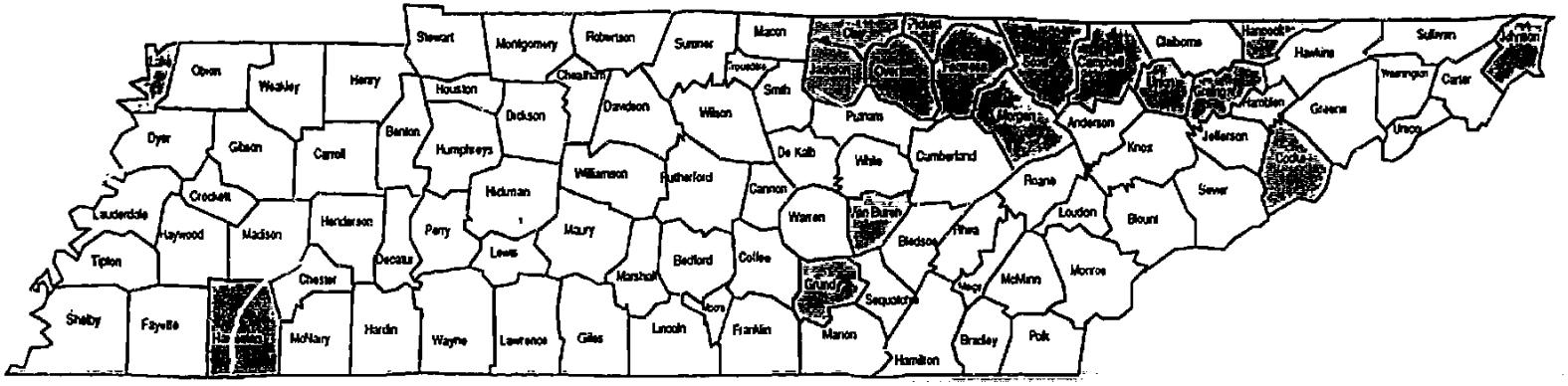
## Project Challenge

Based on the pervasive and positive Project STAR findings, the Tennessee Department of Education initiated a project to implement system-wide reduction of elementary grades K-3 class size within school districts located in Tennessee's poorest counties. Ultimately 17 local school systems met the high percentage criteria for free/reduced-lunch participation for selection to participate in Project Challenge, a class-size reduction effort to improve academic achievement for "at-risk" students in Tennessee. The systems were located in the lowest per-capita income counties in the State. Most (15 out of the 17) operate in rural Appalachian communities in East Tennessee; two are in West Tennessee (See **Figure 1**).

Federal Chapter I funds supplemented the costs for small classes within individual schools that met the federal requirements. Beginning in the 1989-90 school year, to permit system-wide implementation, the Department allocated State funds to the remaining schools in selected school systems that did not meet the federal Chapter I guidelines, but which had 60 to 74 percent of students who qualified for free or reduced lunch.

Through Project Challenge, Tennessee's Department of Education has provided an opportunity for Tennessee school systems located in the poorest counties to offer their students and teachers the advantages (e.g., more personal interaction, individualized instruction, close monitoring, immediate feedback, etc.) of small classes. This evaluation is an initial attempt to document the influence of class-size reduction on overall student achievement, without controlling for other school interventions, assuring random student assignment, and without engaging in any special testing or providing staff training.

# FIGURE 1




Location of Project Challenge School Systems

The Tennessee Department of Education requested that The Center of Excellence for Research in Basic Skills at Tennessee State University begin to evaluate the effectiveness of Project Challenge in relation to the Lasting Benefits Study (LBS) being conducted by the Center. The Center began in 1990 conducting the longitudinal, follow-up study to determine the lasting benefits of small classes for Project STAR students, and is now beginning to evaluate the subsequent implementation of reduced class-size in the 17 participating Project Challenge school systems in terms of student achievement. The research is jointly supported by a Tennessee Department of Education contract and the Center of Excellence for Research in Basic Skills.

## Background

Summary of Findings for Project STAR and LBS. The Student Teacher Achievement Ratio Project (Project STAR), Tennessee's four-year longitudinal experimental class-size study, demonstrated that reduced class size (1:15) in kindergarten through third grade (K-3) significantly enhanced student achievement. The Project STAR study insured random assignment of students to three class-size interventions: small classes (13 to 17 students per teacher), regular classes (22 to 25), and regular classes with a full-time teacher's aide. The sample contained over 6,000 students in 42 districts and as many as 79 schools classified as inner-city, rural, urban, or suburban. *Overall findings of Project STAR indicated a significant (statistically and educationally) achievement advantage (specifically in reading and mathematics) for students who were in small classes*. The longitudinal follow-up of Project STAR, the Lasting Benefits Study (LBS), has shown that the achievement benefits for students in grades K-3 small classes are retained at least two years after (through fifth grade) the student

leaves the small-class condition. *Even after two years, fifth-grade students who had been in grades K-3 small classes maintain a statistically significant achievement advantage over the fifth-graders who had been in Project STAR regular classes and classes with a full-time aide.*

Students in all locations (rural, urban, suburban, and inner-city) benefited from small classes in grades K-3. Small-class students in rural areas scored highest on academic achievement tests in general, although inner-city students (who were performing below the State mean) in grades K-3 scored the greatest gains. In the LBS analysis the small-class treatment in grades K-3 benefited all students regardless of school system geographic location.

The Project STAR research also supports the existing class-size literature regarding the use of more desirable teaching practices in small classes. Johnston's (1990) analysis of a large number of teacher interviews found that grades K-3 small-class teachers reported engaging in teaching practices that, in accordance with Bredekamp (1987), are considered developmentally appropriate and congruent with the early childhood education literature.

Project STAR results confirm that teachers of small classes are also able to address children's individual social and emotional needs and problems (Word et al., 1990). Given the changing nature of families and of the increasing poverty-related needs of children (Hamburg, 1992; Hodgkinson, 1991), this attention may be important in redefining the teaching processes in early primary grades. Small-class teachers indicated that they had better knowledge of children as individuals, their families and their home backgrounds. These teachers reported that their relations with children were improved; and that children's relations with each other were more positive. The extent to which teachers and children were friendly, supportive, and trusting of one another was an indication of the peer cohesion of children and the "esprit de corps" of the group as a whole (Johnston

& Davis, 1989). This dimension of positive interaction is an indicator of classroom morale and team spirit that is characteristic of effective elementary schools.

Project STAR is currently regarded as the definitive class-size study. *The Project STAR study has been cited as "the most significant educational research done in the U.S. during the past 25 years"* (Orlich, 1991, p. 632). Project STAR results have prompted administrators in some states to reduce elementary class sizes, and at the very least the findings have contributed to a national reevaluation of the class-size issue by educational policy makers at all levels (Gillman, 1990; Nye et al., 1992; Folger, 1989/92).

Findings from Project STAR and other class-size studies show that small classes can be both emotionally and academically beneficial to young children. If teachers in Project Challenge schools can focus on each child's psychological, social, and academic needs through smaller classes, this could provide all students and particularly low-income, educationally at-risk children with the extra boost needed to help them become academically successful and perhaps contribute to their overall well-being.

Class-size reduction can be expensive and, therefore, may be considered as less feasible to implement than other interventions. However, other interventions have not been shown to be as uniformly successful as class size reduction in terms of raising overall student achievement. Also some interventions have hidden costs such as long-term specialized staff training, resource personnel costs, and other required support services (Nye, et al., 1992).

New federal Chapter I flexibility has allowed state and local cooperative efforts for reducing class size to become a reality in several Tennessee school systems. The Hawkins-Stafford Amendment of 1988 has made it possible for schools serving a large number of children from low-income families to use

federal Chapter I funds for all students, not just for those labeled "low achievers." Federal Chapter I funding is available to fund state projects that improve the total educational program of a school. State educators are permitted to design projects that fit their specific educational objectives. Projects are only open to schools with student enrollment of 75% or greater who are from families with poverty incomes, as measured by federal free-lunch program participation. Within these guidelines, state leaders are permitted to select schools for project participation. Tennessee has taken this opportunity to enhance student achievement through reducing class size for schools that meet this criteria.

## Design and Limitations of the Project Challenge Evaluation

Historical test data comparison. Prior to the 1989-90 school year, Tennessee schools were required to administer the Stanford Achievement Test (SAT) for students in 2nd, 5th, and 7th grades. The Basic Skills First (BSF) test was administered to students in the 3rd, 6th and 8th grades. Beginning in 1989-90 students in the 2nd through 8th grades and the 10th grade were required to take the Tennessee Comprehensive Assessment Program (TCAP) achievement test. The TCAP includes a norm-referenced test (NRT) and a criterion-referenced test (CRT) component.

Since no special testing was prescribed for Project Challenge, the extant data and present TCAP testing processes had to be used in the evaluation plan. Furthermore, because there are no means by which to compare SAT (1988-89) with TCAP (1989-90) scores directly, the 1989-90 TCAP second-grade results had to be used as the "baseline" data for Project Challenge. This baseline selection is preferred to the alternative use of pre-Project Challenge (no time in small classes) SAT results because of the confidence achieved from the comparison of TCAP scores from year to year. Consequently, the 1989-90

second-grade student "baseline" sample already had one year of small-class treatment, and their scores are compared to the 1990-91 TCAP test results of second-grade students who have had two years in small classes. (See **Table 1.**)

**Table 1**

**Project Challenge (1990-93): Summary of Student Participation & Years Tested by the TN Comprehensive Assessment Program (TCAP)**

| Testing Year (Date) (TCAP) | Grade-2 students' small-class experience in Project Challenge (number of years) by grade(s) | |
|---|---|---|
| Test Date | Years of Project Challenge | Grades in Project Challenge |
| 1990 | 1 | grade two only |
| 1991 | 2 | grades one & two |
| 1992 | 3 | grades K, one & two |
| 1993 | 4 | grades K, one & two |

Ultimately, it was necessary to extrapolate some analysis information from Tennessee's Project STAR (Word et al., 1990) in order to design aspects of the Project Challenge evaluation. Project STAR researchers found that the achievement gains for a second-grade sample with no prior small-class experience were not so large as to suggest a dramatic positive change in their scores at that grade level. The treatment occurs at the time the student enters the small-class condition for the first time, so the 1989-90 second-grade "baseline" is contaminated, but it seems to be the most appropriate data available for this purpose.

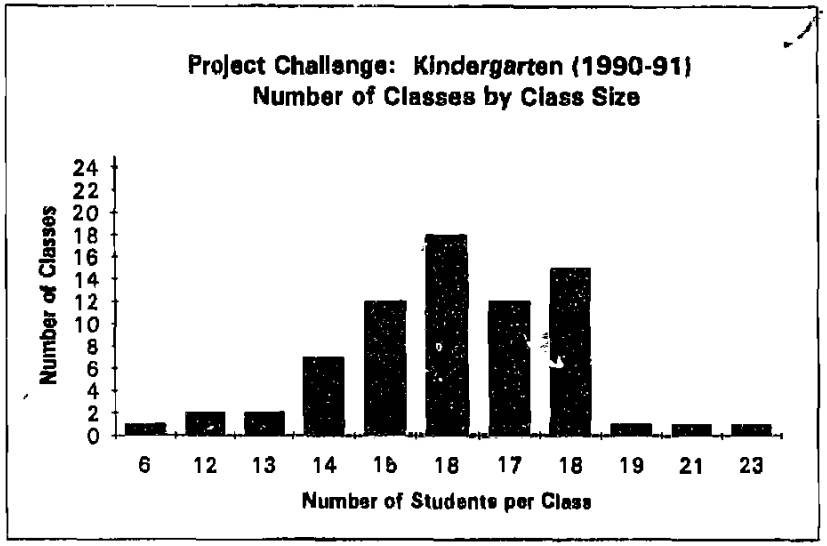
Student roster analysis. General demographic data were collected through the

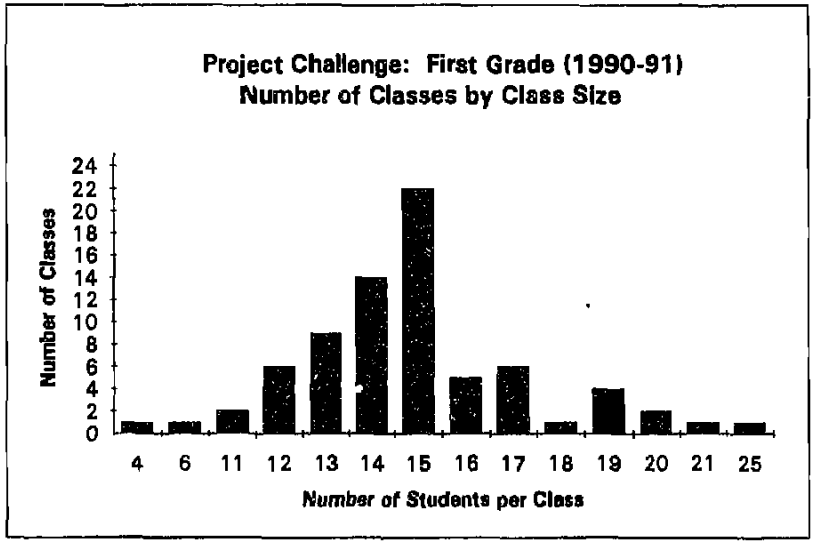
Classroom Information Survey (**Appendix A**). This survey indicated that for the 1990-91 school year most class sizes ranged from 13 to 17 students per teacher. (See **Figure 2**.) However 25% of the kindergarten, 12% of the first-grade, 10% of the second-grade, and 13% of the third-grade classes exceeded 17 students (this is the maximum number of students to be considered a small class, Word et al.). Should exact data concerning the average class sizes in grades K-3-- one year prior to the initiation of Project Challenge(1988) through the 1990 school year--become available, it may be possible to be more precise in some of the analyses and summary statements. This will involve collecting class rosters during 1992-93 of the ongoing study if future funding permits Project Challenge data analysis.

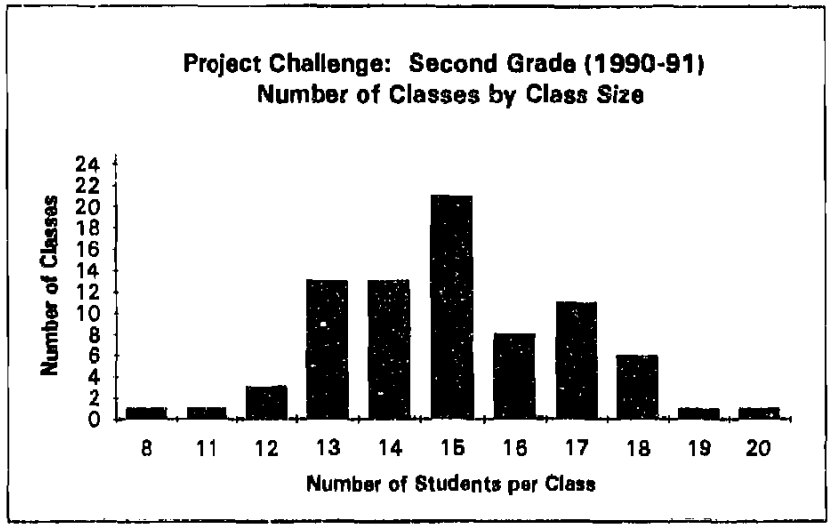
Intervening Variables. Since Project Challenge is not an "experiment" there was no random selection or assignment of students and no special testing, etc.. The evaluation essentially employs an after-the-fact (post hoc) review and analysis of grouped (second-grade, system-wide) data. There were no controls for other special "interventions" that may have occurred during the Project Challenge implementation. Therefore, evaluation staff have no means by which to make conclusions regarding achievement gain (or loss) solely as a result of the class-size reduction. There may also be other systematic threats to the validity of the preliminary findings, such as the presence of inflated class sizes when schools could not fully implement class reductions.

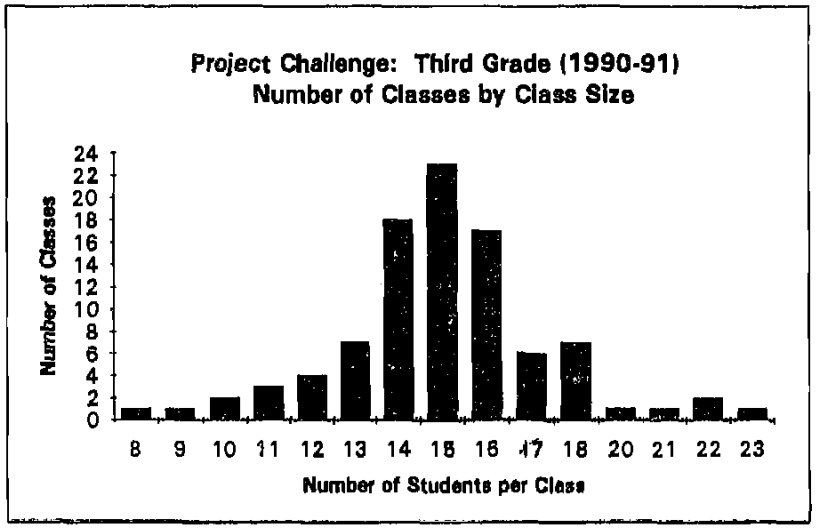
These initial evaluation results will help establish baselines and trends for the class-size reduction effort in Project Challenge systems. Data from these systems will need to be analyzed more thoroughly to determine student achievement gains. Accurate interpretation will require tracking through student rosters to ensure class-size reductions over time and data on other school system-wide

Figure 2



interventions in the Project Challenge counties that may also influence pupil progress.

Grouped data. Grouped data by grade level are inherently susceptible to variations in student ability by classes or by grades. Gains (or losses) in one year may be the result of very good (or very poor) student ability, excellent teaching, test variation, etc. It is only with several continuous years of results that a definite trend can become evident.

## Preliminary Evaluation Findings

Results based on rankings of systems. One method to ascertain if Project Challenge class-size reduction (1:15) appears to be making some impact on academic achievement was the comparison of the 17 systems' ranking among the 138 Tennessee systems based upon second-grade (1989-90 and 1990-91) TCAP scaled scores. This was done for both reading and mathematics by adding the rankings, dividing (by 17) and comparing the resulting average ranks on mathematics and reading. (See **Table 2.**) Of the 17 Project Challenge systems, from 1990-1991, nine improved their rankings in reading and ten improved in mathematics. This is a gross measure since it does not take into account the amount of the movement from their 1988-89 to 1989-90 rank. *Generally, the Project Challenge systems as a whole are moving closer to the State average.* As shown in **Table 2**, Challenge systems gained an average of 5.3 ranks in reading and 6.6 ranks in math. The average rank of the Project Challenge systems (94 in reading and 79 in math) is still considerably below the state average of 69 (of 138 systems).

## Table 2

### Rankings of Project Challenge Districts (n = 17) of 138 Tennessee School Systems (1990 and 1991) Based on Grade-Two Reading and Mathematics Scores Measured by the TN Comprehensive Assessment Program (TCAP)*

| | Reading | | Mathematics | |
|---|---|---|---|---|
| | 1989-90 | 1990-91 | 1989-90 | 1990-91 |
| Sum of Ranks | 1681 | 1591 | 1448 | 1336 |
| Divided by (n = 17) | 98.9 | 93.6 | 85.2 | 78.6 |
| Difference in 1990 and 1991 | Gain (+90) in total of ranks | | Gain (+112) in total of ranks | |
| Divided by (n = 17) | Average Gain 5.3 ranks | | Average Gain 6.6 ranks | |

*Using 138 systems as the base, the average district rank is 69.

Results based on Z-score comparisons. A second procedure entailed the conversion of the school system's average TCAP scores to Z-scores and then the determination of extent to which the 17 Project Challenge systems' second-grade average scores in reading and mathematics deviate (i.e., in terms of standard deviation units) from the state average. Again, using the 1990 and the 1991 TCAP testing results, some gains are evident. (See Table 3.)

## Table 3

### Comparison of Project Challenge Systems (n = 17) Average Z-Scores for Reading and Mathematics, 1989-90 to 1990-91, Grade Two, TN Comprehensive Assessment Program Results

| | Reading | | Mathematics | |
|---|---|---|---|---|
| Year | 1989-90 | 1990-91 | 1989-90 | 1990-91 |
| Z-Score | -.75 | -.52 | -.34 | -.08 |
| Difference | Gain of .23 | | Gain of .26 | |

Although the average Z-scores for both reading and mathematics and for both 1990 and 1991 TCAP test results for the 17 systems are below the state average, there has been nearly a quarter (.25) of a standard deviation gain. Thus, these 17 systems, between 1990 and 1991, have moved closer to the State TCAP mathematics and reading mean test scores.

*The gains in rankings and in Z-score comparisons suggest that, on average, the second-grade results on TCAP indicated achievement benefits that might be attributed to participation in small classes: student scores are getting better as the systems move closer to the median state ranking.* Tables 4 through 8 provide more details regarding Z-score comparisons and rank-order differences.

**Table 4** shows that nine of the Project Challenge systems improved their state ranking on the TCAP Reading sub-score between the end of the 1990 and 1991 school years. The range of increase in rankings was from 1 to 117 ranks. Eight Project Challenge systems had a decrease in rank ranging anywhere from 1 to 62 rank positions. The mean increase in rank was 5 positions.

## TABLE 4. Details of TCAP Score and Rank Change (1990-1991): Project Challenge Districts

### Total Reading

| Districts (1-139) | System Name | System Number | SAT 1989 Z Score | SAT 1989 Rank | TCAP 1990 Z Score | TCAP 1990 Rank | TCAP 1991 Z Score | TCAP 1991 Rank | 90 v. 91 Diff. Z Score | 90 v. 91 Diff. Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | Campbell Co. | 070 | -1.49 | 132 | -1.65 | 132 | -0.57 | 104 | 1.08 | 28 |
| 24 | Clay County | 140 | 1.55 | 10 | 0.82 | 27 | 0.38 | 42 | -0.44 | -15 |
| 25 | Cocke County | 150 | -0.58 | 100 | 0.13 | 62 | -0.43 | 98 | -0.56 | -36 |
| 41 | Fentress Co. | 250 | -0.67 | 107 | 0.13 | 59 | -1.01 | 121 | -1.14 | -62 |
| 49 | Grainger Co. | 280 | -0.26 | 78 | -0.55 | 105 | -0.43 | 97 | 0.12 | 8 |
| 52 | Grundy County | 310 | 2.95 | 1 | -0.90 | 119 | -1.01 | 122 | -0.11 | -3 |
| 56 | Hancock Co. | 340 | 1.55 | 9 | -1.10 | 124 | -0.21 | 88 | 0.89 | 36 |
| 57 | Hardeman Co. | 350 | -0.91 | 123 | -1.59 | 131 | -1.15 | 126 | 0.44 | 5 |
| 69 | Jackson Co. | 440 | -0.67 | 108 | -0.83 | 114 | -1.88 | 132 | -1.05 | -18 |
| 71 | Johnson Co. | 460 | -0.67 | 103 | -0.49 | 101 | -1.74 | 129 | -1.25 | -28 |
| 73 | Lake County | 480 | -0.50 | 94 | -3.03 | 138 | -0.86 | 118 | 2.17 | 20 |
| 97 | Morgan County | 650 | -1.32 | 129 | -1.31 | 128 | -0.21 | 89 | 1.10 | 39 |
| 100 | Overton Co. | 670 | -0.01 | 65 | 0.34 | 48 | 0.18 | 53 | -0.18 | -5 |
| 102 | Pickett County | 690 | 1.47 | 11 | 1.92 | 3 | 2.34 | 2 | 0.42 | 1 |
| 112 | Scott County | 760 | -1.73 | 136 | -1.38 | 130 | -1.52 | 127 | -0.14 | 3 |
| 128 | Union County | 870 | -2.14 | 138 | -2.14 | 136 | -2.61 | 137 | -0.47 | -1 |
| 129 | Van Buren Co. | 880 | -0.75 | 113 | -1.10 | 123 | 1.83 | 6 | 2.93 | 117 |
| | **MEANS** | | **-0.25** | **85.7** | **-0.75** | **98.8** | **-0.62** | **93.6** | **0.22** | **6** |

| | |
|---|---|
| Shade | = Positive or negative 0.5 SD on Difference of Z Scores (Diff. Z Score) |
| Box | = Rank moved "up" 14 rankings or approximately 10%. |
| Shade | = Note negative movement on Difference of Ranks (Diff. Rank). |

**Table 5** indicates that ten of the Project Challenge school systems improved their rank position on the TCAP Math sub-score between the end of the 1990 and 1991 school years. The range of increase in rankings was from 1 to 99 rank positions. Seven Project Challenge school systems had a decrease in rank ranging from 4 to 75 rank positions. Overall, the mean difference in rank was increased 7 positions.

**Table 6** denotes twelve Project Challenge school systems moving upward in the rankings on the TCAP Total Language sub-score. The range of increase in rankings was from 1 to 86 ranks. Five Project Challenge school systems had a decrease in rank ranging from 2 to 80 positions. Overall, the mean difference in rank was increased 4 positions.

**Table 7** shows that eleven of the Project Challenge school systems improved their rank position on the TCAP Word Analysis sub-score between the end of the 1990 and 1991 school years. The range of increase in rankings was from 1 to 45 ranks. Five Project Challenge school systems decreased in rank ranging from 11 to 43 positions. Overall, the mean difference in rank was increased 8 positions.

**Table 8** denotes eight Project Challenge systems moving upward in the rankings on the TCAP Science sub-score. The range of increase in rankings was from 2 to 115 ranks. Nine Project Challenge school systems had a decrease in rank ranging from 3 to 38 rank positions. Overall, the mean difference in rank was increased 8 positions.

In summary, the Project Challenge schools have moved up (on average) in their rankings of Tennessee school systems on the second-grade TCAP test. This trend should be monitored and analyzed in more detail to see if it is logical to attribute a substantial portion of this gain to the small-class (1:15) intervention.

TABLE 5. Details of TCAP Score and Rank Change (1990-1991): Project Challenge Districts

Total Math

| Districts (1-139) | System Name | System Number | SAT 1989 Z Score | SAT 1989 Rank | TCAP 1990 Z Score | TCAP 1990 Rank | TCAP 1991 Z Score | TCAP 1991 Rank | 90 v. 91 Diff. Z Score | 90 v. 91 Diff. Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | Campbell Co. | 070 | -0.52 | 103 | -0.90 | 119 | 0.29 | 51 | 1.19 | 68 |
| 24 | Clay County | 140 | 1.42 | 16 | 1.22 | 17 | -0.48 | 92 | -1.70 | -75 |
| 25 | Cocke County | 150 | -0.70 | 113 | -0.26 | 80 | -0.25 | 84 | 0.01 | -4 |
| 41 | Fentress Co. | 250 | -0.89 | 117 | 0.32 | 47 | -0.25 | 86 | -0.57 | -39 |
| 49 | Grainger Co. | 290 | -0.24 | 80 | -0.06 | 70 | -0.13 | 83 | -0.07 | -13 |
| 52 | Grundy County | 310 | 2.71 | 2 | -0.45 | 93 | -0.84 | 112 | -0.39 | -19 |
| 56 | Hancock Co. | 340 | 2.07 | 5 | -0.64 | 105 | -0.36 | 90 | 0.28 | 15 |
| 57 | Hardeman Co. | 350 | -0.43 | 95 | -1.73 | 134 | -1.02 | 123 | 0.71 | 11 |
| 69 | Jackson Co. | 440 | -1.07 | 122 | -0.45 | 92 | -0.96 | 121 | -0.51 | -29 |
| 71 | Johnson Co. | 460 | -0.15 | 76 | -0.19 | 77 | -0.90 | 116 | -0.71 | -39 |
| 73 | Lake County | 480 | 0.13 | 59 | -1.15 | 128 | 0.77 | 29 | 1.92 | 99 |
| 97 | Morgan County | 650 | -1.35 | 128 | -1.67 | 133 | -0.48 | 93 | 1.19 | 40 |
| 100 | Overton Co. | 670 | 0.40 | 41 | 0.51 | 36 | 1.00 | 21 | 0.49 | 15 |
| 102 | Pickett County | 690 | 1.60 | 10 | 2.69 | 2 | 2.79 | 1 | 0.10 | 1 |
| 112 | Scott County | 760 | -1.53 | 133 | -1.28 | 130 | -0.42 | 91 | 0.86 | 39 |
| 128 | Union County | 870 | -1.17 | 126 | -1.99 | 137 | -1.67 | 134 | 0.32 | 3 |
| 129 | Van Buren Co. | 880 | -0.52 | 101 | 0.32 | 48 | 1.54 | 9 | 1.22 | 39 |
| | MEANS | | -0.01 | 78.1 | -0.34 | 85.2 | -0.08 | 78.6 | 0.26 | 7 |

| | |
|---|---|
| Shade | = Positive or negative 0.5 SD on Difference of Z Scores (Diff. Z Score) |
| Box | = Rank moved "up" 14 rankings or approximately 10%. |
| Shade | = Note negative movement on Difference of Ranks (Diff. Rank). |

# TABLE 6. Details of TCAP Score and Rank Change (1990-1991): Project Challenge Districts

## Total Language

| Districts (1-139) | System Name | System Number | TCAP 1990 Z Score | TCAP 1990 Rank | TCAP 1991 Z Score | TCAP 1991 Rank | 90 v. 91 Diff. Z Score | 90 v. 91 Diff. Rank |
|---|---|---|---|---|---|---|---|---|
| 12 | Campbell Co. | 070 | -1.43 | 129 | -0.68 | 110 | 0.75 | 19 |
| 24 | Clay County | 140 | 1.00 | 20 | -0.95 | 69 | -1.95 | -49 |
| 25 | Cocke County | 150 | -0.18 | 75 | -1.13 | 123 | -0.95 | -48 |
| 41 | Fentress Co. | 250 | 0.81 | 37 | -0.66 | 117 | -1.47 | -80 |
| 49 | Grainger Co. | 290 | -0.41 | 96 | -0.15 | 80 | 0.26 | 16 |
| 52 | Grundy County | 310 | -0.80 | 117 | -0.77 | 113 | 0.03 | 4 |
| 56 | Hancock Co. | 340 | -2.05 | 136 | -1.84 | 131 | 0.21 | 5 |
| 57 | Hardeman Co. | 350 | -1.66 | 132 | -1.04 | 122 | 0.62 | 10 |
| 69 | Jackson Co. | 440 | -0.57 | 102 | -1.48 | 129 | -0.91 | -27 |
| 71 | Johnson Co. | 460 | -1.11 | 124 | -1.30 | 126 | -0.19 | -2 |
| 73 | Lake County | 480 | -1.74 | 133 | 0.38 | 47 | 2.12 | 86 |
| 97 | Morgan County | 630 | -1.27 | 126 | -0.06 | 74 | 1.21 | 52 |
| 100 | Overton Co. | 670 | -0.10 | 67 | 0.24 | 56 | 0.34 | 11 |
| 102 | Pickett County | 690 | 2.48 | 2 | 3.04 | 1 | 0.56 | 1 |
| 112 | Scott County | 760 | -1.51 | 130 | -0.86 | 118 | 0.65 | 12 |
| 128 | Union County | 870 | -2.29 | 136 | -1.93 | 135 | 0.36 | 3 |
| 129 | Van Buren Co. | 880 | -0.18 | 73 | 1.09 | 18 | 1.27 | 55 |
| | MEANS | | -0.66 | 96.3 | -0.44 | 92.3 | 0.22 | 4 |

| | |
|---|---|
| Shade | = Positive or negative 0.5 SD on Difference of Z Scores (Diff. Z Score) |
| Box | = Rank moved "up" 14 rankings or approximately 10%. |
| Shade | = Rank moved "down" 14 rankings or approximately 10%. |

TABLE 7. Details of TCAP Score and Rank Change (1990-1991): Project Challenge Districts

Word Analysis

| Districts (1-139) | System Name | System Number | TCAP 1990 Z Score | TCAP 1990 Rank | TCAP 1991 Z Score | TCAP 1991 Rank | 90 v. 91 Diff. Z Score | 90 v. 91 Diff. Rank |
|---|---|---|---|---|---|---|---|---|
| 12 | Campbell Co. | 070 | -1.14 | 123 | -0.42 | 94 | 0.72 | 29 |
| 24 | Clay County | 140 | 2.14 | 5 | 1.08 | 16 | -1.06 | -11 |
| 25 | Cocke County | 150 | 0.17 | 57 | -0.57 | 100 | -0.74 | -43 |
| 41 | Fentress Co. | 250 | -0.46 | 96 | -0.97 | 122 | -0.51 | -26 |
| 49 | Grainger Co. | 290 | -0.46 | 98 | 0.03 | 66 | 0.49 | 32 |
| 52 | Grundy County | 310 | -0.77 | 108 | -0.82 | 116 | -0.05 | -8 |
| 56 | Hancock Co. | 340 | -0.70 | 95 | 0.03 | 68 | 0.73 | 27 |
| 57 | Hardeman Co. | 350 | -1.35 | 132 | -0.87 | 118 | 0.48 | 14 |
| 69 | Jackson Co. | 440 | -0.88 | 115 | -1.17 | 129 | -0.29 | -14 |
| 71 | Johnson Co. | 460 | -0.51 | 101 | -0.57 | 101 | -0.06 | 0 |
| 73 | Lake County | 480 | -2.24 | 137 | -0.42 | 92 | 1.82 | 45 |
| 97 | Morgan County | 650 | -1.19 | 126 | -0.72 | 109 | 0.47 | 17 |
| 100 | Overton Co. | 670 | 0.69 | 34 | 1.48 | 9 | 0.79 | 25 |
| 102 | Pickett County | 690 | 2.32 | 2 | 4.08 | 1 | 1.76 | 1 |
| 112 | Scott County | 760 | -1.14 | 124 | -0.87 | 120 | 0.27 | 4 |
| 128 | Union County | 870 | -2.66 | 138 | -2.58 | 137 | 0.08 | 1 |
| 129 | Van Buren Co. | 880 | 0.64 | 37 | 2.48 | 2 | 1.84 | 35 |
| | MEANS | | -0.44 | 89.9 | -0.05 | 82.4 | 0.40 | 8 |

| | |
|---|---|
| Shade | = Positive or negative 0.5 SD on Difference of Z Scores (Diff. Z Score) |
| Box | = Rank moved "up" 14 rankings or approximately 10%. |
| Shade | = Rank moved "down" 14 rankings or approximately 10%. |

# TABLE 8. Details of TCAP Score and Rank Change (1990-1991): Project Challenge Districts

## Science

| Districts (1-139) | System Name | System Number | TCAP 1990 Z Score | TCAP 1990 Rank | TCAP 1991 Z Score | TCAP 1991 Rank | 90 v. 91 Diff. Z Score | 90 v. 91 Diff. Rank |
|---|---|---|---|---|---|---|---|---|
| 12 | Campbell Co. | 070 | -0.37 | 100 | -0.29 | 85 | 0.08 | 15 |
| 24 | Clay County | 140 | 0.82 | 24 | 0.24 | 51 | -0.58 | -27 |
| 25 | Cocke County | 150 | -0.30 | 90 | -0.49 | 97 | -0.19 | -7 |
| 41 | Fentress Co. | 250 | 0.00 | 68 | -0.68 | 105 | -0.68 | -37 |
| 49 | Grainger Co. | 290 | -0.07 | 71 | -0.49 | 96 | -0.42 | -25 |
| 52 | Grundy County | 310 | -0.59 | 115 | -0.88 | 118 | -0.29 | -3 |
| 56 | Hancock Co. | 340 | -0.30 | 92 | 1.47 | 128 | 1.77 | -36 |
| 57 | Hardeman Co. | 350 | -0.97 | 126 | -0.29 | 88 | 0.68 | 38 |
| 69 | Jackson Co. | 440 | -0.37 | 104 | -1.40 | 126 | -1.03 | -22 |
| 71 | Johnson Co. | 460 | -0.30 | 91 | -1.47 | 129 | -1.17 | -38 |
| 73 | Lake County | 480 | -3.28 | 138 | -0.03 | 73 | 3.25 | 65 |
| 97 | Morgan County | 650 | -1.04 | 127 | 0.70 | 31 | 1.74 | 96 |
| 100 | Overton Co. | 670 | 0.67 | 31 | 0.50 | 37 | -0.17 | -6 |
| 102 | Pickett County | 690 | 1.72 | 5 | 2.80 | 3 | 1.08 | 2 |
| 112 | Scott County | 760 | -2.01 | 135 | -0.47 | 130 | 1.54 | 5 |
| 128 | Union County | 870 | -1.64 | 133 | -0.40 | 127 | 1.24 | 6 |
| 129 | Van Buren Co. | 880 | -0.67 | 119 | 2.47 | 4 | 3.14 | 115 |
| | MEANS | | -0.51 | 92.3 | 0.08 | 84.0 | 0.59 | 8 |

| | |
|---|---|
| Shade | = Positive or negative 0.5 SD on Difference of Z Scores (Diff. Z Score) |
| Box | = Rank moved "up" 14 rankings or approximately 10%. |
| Shade | = Rank moved "down" 14 rankings or approximately 10%. |

## Future Analyses

To obtain more precise information on student achievement changes, evaluators need exact counts of the numbers of students/teacher in all target grades for each year of the Project Challenge implementation and for at least one year prior (1988-89). This is particularly important as the analysis (second-grade averages) presumes that the changes occurred in all grades rather than the major gains occurring at the time of treatment. This analysis may greatly understate any positive gains from small classes.

Another way to check on gains in target grades (K-3) will be through analyses of Chapter I data from as many Project Challenge school systems as possible. Given the poverty levels in these systems, it is probable that most, if not all students in the Project Challenge schools will be eligible for Chapter I. If this is the case, it would be useful to identify Chapter I schools and classes that consistently implement 1:15 class-size ratios and analyze only these classes. This analysis might be initiated after the other data-collection possibilities are examined and if the other options for more refined data collection do not seem feasible. This option would not require additional testing, but would require coordination between the Tennessee Department of Education and the evaluators in collecting the required data.

## Summary and Recommendations Concerning Class-Size Reduction in Project Challenge Counties

Nationally, rural areas have at least 30% of the population living below the poverty level (Helge, 1988). Thus, rural schools are often characterized by a large proportion of economically disadvantaged students. The declining need for farm workers and the closing of local mines and small industries in rural areas

have created high unemployment rates, often above the national average. A myriad of family problems accompany economic problems of high unemployment and poverty and often leave children victims of broken homes or intense family stress ("End of the Road," 1988).

Other conditions associated with rural environments include health issues such as high teen pregnancy and low birth-weight baby rates (Hodgkinson, 1985), limited opportunity for various careers due to geographic isolation, limited availability of entertainment and cultural enrichment, reduced access to support services due to transportation problems, and lower family support for education ("End of the Road," 1988) due to lower literacy levels in rural areas. These and other factors place a significant number of students "at-risk" of educational difficulty or failure in school.

In addition to high unemployment or under employment at minimum wage or part-time work, rural communities are plagued with low property assessment values, a condition that directly impacts the amount of funds available for education (Honeyman et al., 1989). Many rural schools operate without adequate facilities, support services, and educational tools and materials (e.g., computers). For example, many schools do not have guidance counselors to address the "at-risk" students' developmental and psychological needs.

Small classes implemented in the early primary grades may mitigate some circumstances with which rural at-risk children are forced to cope and rural children in general experience. Bredekamp (1987) asserts that the developmental appropriateness of an early childhood education program depends most on the direct interactions between adults and children. Thus, a significant reduction of class size should make a positive contribution to developmentally appropriate practice in primary-grade classrooms because of increased possibilities for student-teacher interactions. The class-size-reduction intervention in rural

schools may be particularly cost-effective since some classes are already smaller as a result of the geographic location in less populated rural communities.

Further, small-size classes foster more developmentally appropriate non-academic interpersonal interactions among the children and between teachers and children. Robinson and Wittebols (1986) conclude that smaller classes tend to promote the use of more desirable teaching practices such as one-on-one interactions with each child, and "individualization" of instruction. These "non-academic" improvements contribute to the child's overall sense of self-esteem, which has been shown to enhance the child's ability to master "academic" knowledge and skills. (Ramey, 1992).

*The preliminary evaluation of Project Challenge findings and the research literature support the continuing reduction of class size in the Project Challenge counties as one important strategy to improve student academic scores.* Finally, the Lasting Benefits Study is adding to the knowledge base that class-size reduction in the primary grades provides an environment to increase students' level of participation in school activities (Finn et al., 1992), and that this type of early intervention will have long-term social and economic benefits (e.g., Weikart, 1989; Zigler, 1992).

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# Appendix A

APPENDIX A

LASTING BENEFITS STUDY
Project Challenge
Classroom Information Survey

Please provide the following information about yourself and your current class. Please disregard the numbers in parentheses to the right of the page.

Label Here ****

| | For Data Entry Use Only |
|---|---|
| **TEACHER INFORMATION** | |
| Name: _____ | (22-31) |
| Social Security No.: _____-____-_____ | (32-40) |
| Sex: (circle one) 1 = Male 2 = Female | (41) |
| Race: (circle one) 1 = White 2 = Black 3 = Other | (42) |
| Grade (circle one) K = Kindergarten 1 = 1st Grade<br>Level 2 = 2nd Grade 3 = 3rd Grade | (43) |
| **CLASS INFORMATION** | |
| 1. No. of Students on class roll, May 7 _____ | (45-46) |
| a. No. of White Students _____ | (47-48) |
| b. No. of Black Students _____ | (49-50) |
| c. No. of Other Race Students _____ | (51-52) |
| d. No. of Students on Free or Reduced Lunch _____ | (53-54) |
| e. No. of Students Recommended for Promotion to Next Grade _____ | (55-56) |
| 2. No. of Students in Attendance, May 7 _____ | (57-58) |
| 3. I provide primary instruction in the following subject areas: (Please Circle) | |
| a. Language Arts (not reading) 1 = Yes 2 = No | (60) |
| b. Math 1 = Yes 2 = No | (61) |
| c. Reading 1 = Yes 2 = No | (62) |
| d. Science 1 = Yes 2 = No | (63) |
| e. Social Science 1 = Yes 2 = No | (64) |
| f. Other Academic Subjects 1 = Yes 2 = No | (65) |

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